VOL XVII.] [No. 10.

THE

INDIAN FORESTER;

A MONTHLY MAGAZINE

FORESTRY,

AGRICULTURE, SHIKAR & TRAVEL.

EDITED BY

J. S. GAMBLE, M.A., F. L. S.,

CONSERVATOR OF FORESTS, AND DIRECTOR OF THE FOREST SCHOOL, DEHRA DUN.

OCTOBER, 1891.

MUSSOORIE:

PRINTED AT THE MAFASILITE PRINTING WORKS.

1891.

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SEPTEMBER 1891.

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THE

INDIAN FORESTER.

Vol. XVII.] October, 1891. [No. 10.

FORESTRY IN NORTH AMERICA.

PART II.

The portions of the Atlantic forest region, adjoining the extensive western woodless tracts, give Mayr an opportunity of considering the origin of these areas, poor in wood, but for the most part stocked with tall grasses. It may be laid down as a general statement that they are caused by the dry climate of the prairies. The author, however, rightly observes, that a great portion of the prairies of North America possesses a climate moist enough to render the existence of forest possible, and that other non-climatic causes must be considered to account for the absence of trees. This question is also discussed by Sergent in the introduction to his book which has been already referred to. The annual forest fires have destroyed the primæval forest in this region, and prevent its restoration. A zone, poor in wood, bordering along the west side of the Atlantic forest tract and separating it from the true prairie land, is described by Sergent as prairie with less than 20 per cent of forest. This zone, which to the east has a remarkable bending towards Lake Michigan, was, before the introduction of woods, limited to the damp low land protected against fire, which extended along the sides of the water-courses.

When the land was brought under cultivation, and fields took the place of grassy plains and checked the fires, the forest spread and it has therefore happened in Wisconsin, Illinois, Iowa and other States, that the forest is naturally regenerating itself in many places by seed or coppice shoots, and continually increasing in area. In Western Texas, latitude 30 degrees, extensive areas of woods of Mesquit bean *Prosopis juliflora*, had altogether disappeared owing to the annual forest fires.

Irregular underground stocks sent out shoots which were destroyed annually by the fires, and, so to speak, coppiced. Now, however, that the fires have become less frequent and severe, large areas have become re-stocked with this species, partly by seedlings and partly by coppice shoots. In a similar way in all provinces of British India on both sides of the Ganges, the forest is extending at the cost of the Savannah wherever the annual forest fires have been checked and other causes do not hinder its re-growth. Much

has also been done in several of the States by plantations, which flourish in this badly wooded country wherever the climate is sufficiently moist. What Sergent states of Kansas will illustrate the above remarks. In the eastern Counties of this State, very extensive plantations have succeeded. In the central and western parts of Kansas, however, where the climate is dry, all attempt to introduce woods have hitherto failed. Even in Missouri, east of Kansas, are a few partly wooded tracts and here the recent spread of woodland is ascribed to the law against forest grazing. (Sergent, p. 560)

In the Northern-Pine zone of the great Atlantic forest region, *Pinus Strobus*, the white pine, as it is called in America, (in Europe known as the Weymouth Pine,) is the most important species for the Forester. Formerly, chiefly mixed with broad-leaved trees, it formed enormous forest tracts from the north coast of the Gulf of St. Lawrence to northern Georgia, and westwards beyond the sources of the Missouri to the river Winnipeg. At present, the only considerable supplies of this valuable timber are to be found in Canada, its principal home, and in the United States in the Lake Districts of the States of Michigan, Wisconsin and Minnesota. These three States at present yield about 80 per cent of the white pine timber used by the United States.

It is long since the Weymouth Pine* was introduced into Europe, and it can well be said that its introduction into Germany was a lucky venture, the importance of which is not, perhaps, as yet, sufficiently recognized.

Even without considering its rapid growth, and its great production of wood, it has two extremely valuable qualities, in its prolonged cover of the soil and dense fall of needles. In the State forest of Nürnberg, every year a vast amount of forest litter must be obtained; and the Weymouth Pine would have been planted upon a large scale were not the seed so dear. Both Fernow and Mayr confirm the statement that most of the Weymouth Pine seed purchased in the United States is imported there from Europe. The exploitation of the Forests of Weymouth Pine in the lake districts is carried out on a vast scale. It is a system of pillaging the forests (Raubwirthschaft) on the greatest scale. These operations have only one object, to bring as much timber as possible out of the forest in the shortest possible time and to make money. Only the best trees are felled and the rest are destroyed by fire.

The remains of such a forest after the first forest fire has destroyed the twigs and leading and side shoots of the trees, present a remarkable appearance. Between the standing blackened and partly carbonised stems of the broad leaved and other trees which have not been felled, are the stumps of the felled pines, and

* *Pinus Strobus* was introduced into England in 1705 and Lord Weymouth was the first to plant it out on a large scale. It may, however, have been cultivated in Paris in the 16th century. *Taxodium distichum and Juniperus virginiana* were introduced into Europe in the first half of the 17th century.

the ground covered with wood which would not have paid for its removal. Whatever portions of this wood do not rot, are burned by the annual fires. However, such wasted forests are not altogether without hope of recovery In the hand of a skilful forester they could soon become productive again. We are not far off the time when, in the Lake districts, capital will be applied on a large scale for productive Forestry. At present, such devastated forests are to be had for a trifling sum, and splendid results would follow from good management. In 1880, in three Lake districts of Michigan, Wisconsin, and Minnesota there were estimated to be 7,000 million cubic feet of standing timber of Weymouth Pine, whilst in the last ten years 6,205 millions cubic feet have been felled and exported, in 1889 alone 750 millions cubic feet. There is therefore little more left than can be exported in a single year.

Many of the large saw-mills have supplies of logs for several years, but others of them have already been obliged to stop work or to get timber from Canada

Chicago alone, the great port to the south of Lake Michigan, which in part owes its rapid rise to the timber trade, imports yearly 161,210,000 c. ft. of wood, all of Weymouth Pine. These forests also yield other coniferous wood and quantities of broad leaved wood. As a comparison, it may here be noted that the annual yield of the Prussian State Forests is 205,800,000 cubic feet which is the annual yield of 6,750,000 acres. The forest timber yard was established in Chicago in 1834, but only by 1843 had the timber attained large proportions. Broad leaved timber was imported at an early date, but at first only in small quantities. Professor Beal (in *Garden and Forest*, 1890, p. 559) relates that he brought out from the forest logs of *Liriodendron tulipiferum* in 1880 to a country store where they were exchanged for various wares. As soon as the supplies of Weymouth Pine in North America and in Canada have been exhausted, the trade will only have the Southern Pine Forests and those of Californian redwood and of Douglas fir in the west to look to.

In the Forests of Weymouth Pine, besides broad leaved trees, there are two other pines, which are chiefly restricted to special kinds of soil :—the gray pine, *Pinus Banksiana*, preferring the poorest sandy soils, a tree of little value but widely spread, from New Brunswick and the Southern coast of Hudson's Bay to the Mackenzie River and the eastern slopes of the Rocky Mountains and southwards to lat. 65 degrees ; and the red pine, *Pinus resinosa*, a valuable similar tree formerly exported under the name of *Strobus*. Mayr says "the soil of the Weymouth 'Pine gives the best meadows, that of the Red Pine, inferior 'wheat soil, whilst that of Banks' Pine does not repay the cost 'of clearing for cultivation." We have now to describe the northern coniferous forest, which Mayr terms the coniferous forest of the sub-arctic region, Sergent, the northern forest tract (extending in both the Atlantic and Pacific regions) and

Drude, in the work mentioned below* includes in the glacier forest tract of Alaska and British North America. This region is confined to forest bordering on the Arctic Circle in Alaska and British North America. At the summits of the Alleghanies, however, *Picea nigra* and *Abies Fraseri* are found, which belong to it. In Labrador, the forest limits do not extend beyond Lat. 60 degrees, but at the mouth of the Mackenzie river and in Alaska it extends beyond the Arctic circle, as far as Lat. 70 degrees. In the northern part of this region, the forest is thin and scattered. The white and black spruce (*Picea alba* and *nigra*) are characteristic trees, whilst the valleys and lower plains are stocked with poplars, birches, and willows. In the Pacific region, *Picea sitchensis* is found from near the coast to a distance of 50 miles from the sea. In the Atlantic region, the above-mentioned grey pine (*P. Banksiana*) extends from the eastern slopes of the Rocky Mountains to Lat. 65 degrees. This immense forest tract is poor in species; and, as already mentioned, four trees are found throughout the whole breadth of the continent. These are:—1, *Betula papyrifera*, Marshall (Canoe or paper birch) from Labrador to Alaska and from Scandinavia and Washington to British Columbia; 2, *Populus tremuloides* (Aspen) Labrador to Alaska, Pennsylvania and Kentucky to California, and in the highest parts of the Rocky Mountains to New Mexico and Arizona; 3, *Populus balsamifera* (the balsam poplar or Tacamahac) from Hudson's Bay to Alaska, New England to Washington and British Columbia; 4, *Picea alba* (white spruce) from Labrador to Alaska and from Vermont to Sitka and British Columbia.

The second principal sub-division, according to Mayr, "the Prairie" includes the eastern part of Sergent's Pacific tract and the western part of his Atlantic tract, and indeed the greatest part of the great central scantily covered plateaux and of the true Prairies. Sergent terms *Prairie*, the scantily wooded zone to the west of the Atlantic forest region, and the intermediate gradations between this and the central treeless plateau. In this zone, the forest covers less than 20 per cent of the area, and is chiefly found along the banks of the streams. In this scantily wooded region the climate is moist enough for the existence of forests, and the grass has only got the upper hand owing to annual forest fires. Dr. Mayr divides the tract he terms 'Prairie' into three longitudinal zones. The first, the high land to the east of the Rocky Mountains, sloping down towards the east. He attributes the absence of forest here, to the low relative humidity of the air, although the annual rainfall is sufficient for tree growth. Towards the east, the prairie is greatly extended by fire. As already observed, this zone includes a large portion of the scantily wooded tract termed Prairie by Sergent, who places

* Florenkarte von Nord America—Berghaus, Physicalischer Atlas, 1887, No. 50. Handbuch der Pflanzengeographie, Stuttgart, 1890, p. 435.

the west boundaries of it between 95 degrees and 100 degrees W. longitude, whilst Mayr gives 95 degrees as the western boundary of the Atlantic forest region.

The second zone contains the steppe-like tract between the Rocky Mountains and the Sierra Nevada, and its northern prolongation, the Cascade Mountains. The wide low-lands between these two mountain chains often receive only 4 inches of annual rainfall, whilst the relative humidity in the season of vegetation often sinks to 50 per cent or even 40 per cent. In this zone, fruit is only found on the higher mountainous tracts with damper climate. As a third Prairie zone, Mayr designates the prairies between coast range and Cascade range, or Sierra Nevada Here, he states, the forest is wanting, owing to insufficient rainfall, although the relative humidity is sufficiently high. Similar tracts of Savannah are found in India in the inundated plain of the Brahmaputra. Only a few wood species can grow under these exceptional circumstances, among which is *Bombax malabaricum*, the cotton tree, which when leafless in the hot season, decks its verticillate branches with large splendid scarlet blossoms. Ricefields and forest only commence on either side of this extensive lowland when the level becomes somewhat higher.

Another kind of extensive prairie which cannot be at all explained by insufficient humidity is found on the Burmese mountains, especially on those in lat. 17 degrees to the south of the Thaungyin valley and the parallel valley of Haundraw. The valleys and plateaux and lower slopes of the hills are here stocked with a dense tract of evergreen forest; whilst the higher slopes, crests and ridges of the mountain chain, which attains an elevation of 6,500 ft, is clad with grass and ferns, chiefly *Pteris aquilina*. These mountains have a very moist climate with an annual rainfall of 197 inches and with heavy dew during the whole dry season. It is quite possible that these mountains were at one time inhabited by a cultivating tribe with much cattle, and that the forest has not since re-established itself on the abandoned clearings. As far as North America is concerned, it is clearly shown by Mayr and others that the existence of prairies depends on the distribution of precipitation in the different seasons of the year. There are however, extensive prairies or Savannahs in East India, the existence of which must be otherwise explained; and it would be useful to offer some remarks on this subject here. In the inundation tract of the Irrawaddy, for example, are extensive low-lands stocked with high grasses, 10 to 13 feet high and forming impenetrable thickets. In Pegu these Savannahs extend over about 2,000 sq. miles and in the plain of the Irrawaddy have a breadth in lat. 18 degrees of 30 miles. From June to August, they are from 3 to 6 feet deep under water. Rice cultivation is impossible, for the low rice plant cannot live under such a depth of water. The gigantic grasses, however, (several species of *Saccharum* and other *Andropogoneæ*) which form these

Savannahs flourish. A few months after the subsidence of the water, the dry season comes on; and when, in March and April, the grass is quite dry, fires rage through the country, resulting in a blackened wilderness of charred grass halms. But green shoots soon spring up from the rhizomes affording a welcome food to the immense buffalo herds of the Burmese. Relative atmospheric humidity, or amount of rainfall, has here nothing to do with the absence of forest, as these factors are the same here, for the grass lands as for the evergreen forest. Similar grassy tracts alternating with evergreen forest are found in several hilly districts of tropical India, especially on the Nilgiris or Blue mountains. The slopes of these mountains are clad with dense forests down to the plain; but on the highlands themselves, forest is restricted to depressions and steep rocky slopes. These mountains are principally inhabited by two races: the Badagas, who manure and cultivate permanently the land near their villages, but also have intermittent cultivation in other places, letting the land lie fallow for several years in succession; and the Todas, the indigenous race of the country, who do not cultivate, but keep large herds of buffaloes. The intermittent cultivation of the Badagas and the buffalo herds of the Todas afford an explanation of the wide stretches of clearing on these highlands. On the mountains between the rivers Sitang and Salwin east of Toungoo, an extensive tract of primæval forest has been destroyed by the jhuming* of the Karens, and replaced by grass and bushes. Forest is here only found in valleys, and ravines, or on steep rocky slopes. Also beyond the tropics, in the Khasia hills south of the Brahmaputra, extensive grass tracts occur, as well as on the lower ranges of the North-Western Himalaya at 5,000 to 8,000 feet elevation as Mayr has noticed. Mayr is inclined to ascribe the prevalence of such grass tracts to annual forest fires, but though this explanation will suffice in many cases, it is not always sufficient, and other causes must sometimes be looked for. The Savannahs in the plains of the Irrawaddy, Sitang, Salween and other rivers of further India, depend on the protracted deep inundations to which their tracts are subject in summer. The bare uplands of the Nilgiris, as well as the meadows of the southern Schwartzwald are the results of pasturage and extensive and intermittent cultivation. Part of the prairies of North-America, as well as many extensive Savannahs at the foot of the eastern Himalayas, are due to the annual forest fires of the dry season. As regards the bare slopes of the outer North West Himalayas it may be remarked that on the mountain chains which separate the valleys of the Sutlej and Giri, as well as those between the Tons and Jumna rivers, at altitudes between

* Jhuming is a kind of intermittent cultivation by cutting down and burning forest or grass land, which lies fallow for periods of 5—10 years with intervals of 2 years cultivation.

6,500 and 10,000 feet the cooler northern sides of the mountains are forest clad, whilst the southern slopes, which are exposed to the moist south winds are only covered with grass. The question between forest and grass is not so easily settled as one might think. The third chief Sub-Division, which Mayr terms the North Mexican forest region, is confined to the Mountains of New Mexico and Arizona. He distinguishes between the sub-tropical and moderately warm regions. In the former, which extends to an altitude of 6,000 feet, lightly wooded forests, consisting chiefly of Mexican Cypresses are found on the northern slopes, whilst branchy, short stemmed evergreen oaks form little woods along the banks of streams and in damp valleys. The Mesquit bean (*Prosopis juliflora*) is characteristic of the lower, hot and dry regions. In Southern Arizona it attains a height of 50 feet and the knotty stem a diameter averaging one metre, but occasionally it only becomes 20 feet high or may even be like a bush.

In spring, even before the rain has fallen, its delicate, feathered green foliage forms the chief ornament of the dried up areas and its wood yields the fuel of this region. In the neighbouring Mexican province of Sonora, the Mesquit bean is kept down, and even its twigs lopped off for fuel. Hence a thick underground base with strong roots developes, which may be considered an underground forest, as they dig it up for fuel. (Mayr p. 232.) Similar action is taken in Texas, and as in these districts of North America, so in the Savannahs of Northern India; at the foot of the Himalayas, the Sal and other trees form a shapeless knotty often large stool, when he annual shoots are yearly burned off by the forest fires. *Yucca baccata* forms the strangest kind of tree in these dry regions, named the Bayonet tree, a Palm lily, attaining a height of 40 feet, with long leaves 1½ feet long and shaped like bayonets, in tufts at the terminal shoots of the stem and of the few branches; also *Cereus giganteus*, the giant cactus, attains a height of 60 feet and 2 feet diameter.

On the higher mountains, in the North-eastern part of Arizona and in New Mexico, are extensive park-like forests, which stretch along the Rocky Mountains far to the north.

In these forests, three important members of the Pacific forest flora are found:—(1). *Pseudotsuga Douglasii*, which is also found further south on the Mexican Mountains, but in Arizona only attains a height of 80-120 feet with a diameter of 3-4 feet. (2) *Pinus ponderosa*, a true auxiliary of the Douglas fir, which is named the yellow pine in California and Oregon, from the yellowish green of its needles, three in a sheath, which are 3½ to 7½ inches long. (3.) *Abies concolor*, Lindley and Gordon, the Balsam fir.

It must here be mentioned that extensive forests belonging to the North Mexican Forest region passes into this class of Forest on the higher parts of the Rocky Mountains and the mountains between them and the Sierra Nevada.

They are included in the region termed Pacific tract by Sergent. One might distinguish the greater part of it as a middle region lying between the Atlantic and Pacific tracts and possessing forty-six characteristic species. Sergent includes it in the Pacific tract, as most of the species in it belong to the latter. *Cercocarpus ledifolius*, a Rosaceous tree, known as mountain mahogany with hard red heart-wood taking a fine polish; *Quercus undulata*; *Picea Engelmanni*, a Pitch spruce which, in Colorado, forms extensive valuable forests between 8,000 to 10,000 feet altitude, and a few pines; *Pinus edulis*, with great, wingless edible seeds, known as *Piñon*; and *Pinus monophylla*, the one needled pine, may be referred to as examples of the characteristic species of this middle region. These forests are mostly very light and often interrupted by large treeless stretches. In the greater part of it, the climate is dry, but precipitation in the Southern Rocky Mountains is fairly abundant. The forest in this region is not undisturbed; on the contrary, the best wood has long ago been felled for the great mines, for railways and for other purposes. The great Atlantic and Pacific railway passes for 21 miles through what was once a splendid coniferous forest on the San Francisco Mountains, but which is now, for the most part, annihilated.

In the Pacific Forest region, Dr. Mayr distinguishes four regions, the sub-tropical forest, the forest of the moderately hot region, the coniferous forest of the temperate region and the alpine conifers; but here it must suffice to refer to the red wood forests of *Sequoia sempervirens*, along the coast mountains of California and the Douglas fir forests in Oregon and Washington. The coast Sequoias are confined to a district with a warm, very damp climate, and so "permeated with humidity 'is the rich sandy loam in which this tree attains its full 'dimensions, that the removal of heavy logs must be done 'on sledges which, with broad slides slip along the slimy soil." 'The following is the description of a wood which, according to 'Mayr's opinion, represents the still virgin redwood "Forest. About '57 stems to the acre, with a mean growth of 22½ feet 'and an average height of 275 feet, giving 3,350 cubic feet of log 'timber per tree, or 190,000 cubic feet per acre." The average age of this wood is estimated by Mayr to be 703 years, so that the average annual increment per acre is 270 cubic feet. These are large figures. However, Dr. Mayr's data are not obtained by careful measurement of sample areas of average quality, but he considers them reliable average figures, and we have no ground for disbelieving his estimates. Let us compare them with the yield of forests in the Black Forest. In the famous forest range of Pfalzgrafenweiler in Wurttemberg there are silver-fir woods with a mixture of beech, 152 stems per acre, which, at an age of 150 years, with a mean height of 130 feet contain 18,550 cubic feet of

timber, or an annual increment in 150 years of 123 cubic feet per acre, considerably less than half Dr. Mayr's figures for an age of 700 years of *Sequoia sempervirens*. Occasionally this species attains still greater dimensions. Dr. Mayr found a stem is a sheltered valley 308 feet high with a girth of 46·6 feet at 6½ feet from the ground. The first great green branches began at 230 feet up the stem or 65 feet higher than the tallest tree in Germany. Still greater dimensions are attained by the giant Sequoias in the valleys to the west of Sierra Nevada, but the tree has only a circumscribed range. Semler, p. 591, writes as follows:—"Deeper in the mountains than the small groups so often described which are found in Calaveras county, the Mammoth tree extends over an area of 44 English square miles but never forms such an enormous mass of forest as the Redwood." In *Garden and Forest*, 1890, p. 571, is a description of Forest and of patches of this tree lying more to the south, especially in Tulare county with a collective area estimated at 37,500 acres in Oregon, Washington and in the coast mountains of British Columbia.

Here the yearly precipitation of snow and rain is about 63 inches* and dense coats of moss lay on the branches of the Douglas fir and other accompanying conifers. The average height of mature trees is here 213 feet and the thickness about 6½ feet diameter at 6½ feet from the ground. These are average dimensions, but stems over 300 feet high are not uncommon. A young 80 year old wood on the best sandy loam rich in humus in South Oregon (Mayr, p. 297) of quite uniform dense growth, a so-called secondary growth springing from a clearing made by a former forest fire, gives, with a height of 130 feet and 324 stems per acre 58,600 cubic feet of timber per acre or a mean annual increment up to an age of 80 years of 735 cubic feet. In this case also would a complete valuation of a carefully chosen sample area have been of the greatest interest. The great part of these woods is, however, already in the hands of the wood merchants and will soon be turned into money. The State still owns 9,000 acres, of which 3,500 have been demarcated as a reserve and are protected by law.

Sequoia sempervirens reproduces itself easily as coppice, as stated by Semler p. 593 and Kessler, p. 726. Kessler, p. 598 makes a similar statement regarding the Mexican Cypress, *Taxodium Mexicanum*. The coast Sequoia yields almost exclusively the building timber for California, and it is exported to a distance by ships and rail into the poorly wooded districts. But the stock is rapidly disappearing and the wood of the Douglas fir and of the yellow pine from Oregon are invading the district formerly monopolized by the Sequoia.

Among the numerous conifers which grow northwards from

* Mayr in Forest and Jagdzeitung, 1886, p. 61.

California into the coast districts, the Douglas fir *Pseudotsuga Douglasii* is the most important. This most valuable of all North American forest trees is at its best on the declivities and damp valleys of the Cascade mountains. Dr. Mayr's figures are only results from a careful estimation by eye, passed on the measurement of single trees of average dimensions. Nevertheless even these imperfect results give us some means of picturing to ourselves the enormous energy of forest growth under these extremely favourable conditions of soil and climate. Spruce woods of the best quality in Württemberg* eighty years old with 320 stems per acre and an average height of 91 feet give a cubic contents of 11,650 cubic feet or a mean annual increment up to this age of 145 cubic feet per acre.

What an immense difference in the power of roots and leaves and cambium cells to form wood quickly! In one case 735 cubic feet per acre per annum, in the other 145. Examples of such a rapid formation of wood are of the highest scientific interest in order to get a foresight of the time during which the formation of the coal layers in different parts of our globe were forming. If the new, but vigorously developing Forest administration in Japan would give us yield tables of *Cryptomeria japonica*, and other rapid growing forest trees in that country, we might perhaps get similar results. Up to the present time, the only trustworthy measurements giving anything like similar results are those which D. E. Hutchins, now Conservator of Forests in the eastern part of Cape Colony, made in 1882 in the plantations of *Eucalyptus Globulus*, on the Nilgiri mountains of the India Peninsula, in a similar damp mild climate to that of the Douglas fir region. A wood 19 years old, Aramby, at 7,500 feet above sea level with 500 stems per acre and a mean height of 108 feet had a volume of 9,030 cubic feet or thus gave a mean annual increment up to an age of 19 years of 477 cubic feet per acre.

The Douglas fir has not only the property of producing wood in a most extraordinarily rapid manner, when the climate thoroughly suits it, but also can accommodate itself wonderfully to different climatic conditions. It is still an extremely valuable forest tree in the dry climate of Montana, on the mountains which there form the water parting between the Pacific and Atlantic oceans. Towards the south, it extends, as already stated, into the mountains of Texas, Arizona, and northern Mexico up to 30 degrees in latitude, whilst its northern limit is lat. 55 degrees. In Montana, according to Mayr, the annual rainfall is only 23½ inches and here its growth is considerably slower, and the dimensions of the trees smaller than in the damp climate of the mountains of the coast. Mayr gives the mean height and diameter here at

* Lorey, Ertragsuntersuchungen in Fichtenbeständen.—Forst und Jagdzeitung. Supplementary Vol. XII. p. 54.

148 feet and 32 inches with a slow growth. These facts correspond to the habit of the Deodar in its home in the North West Himalayas, where in the damp climate of the outer ranges with a mean annual rainfall of 70 inches it attains a diameter of 24 inches in 80 years, whilst in the dry climate of the inner ranges of the Himalayas it requiries 200 years to arrive at these dimensions

The yellow pine has almost the same habit as the Douglas fir, and its wood is exported in vast masses from the eastern part of Washington, from Montana, Oregon and Idaho. Unless protection be afforded, these forests of the Douglas fir, of the yellow pine and other conifers will be annihilated: here, as in the the pine forests of the eastern coast regions, there are wonderfully large business concerns which are appropriating the colossal timber resources produced by centuries. The wood cutter is followed by the forest fire, which destroys what is left of the forest. Everywhere, up to the present time, the forest of North America is devastated, and thoughtful observers have for a long time raised the question how long the timber supplies will hold out. Attempts have frequently been made to estimate the annual demands for wood in the United States, and in the summary prepared by Fernow (p. 35) for the Paris Exhibition, it has been placed at 22,000 million cubic feet and the total forest area at 695,000 square miles. If all the wood which is felled were utilized, this would yield an annual supply of 50 cubic ft. per acre with good management. But only a small part of the wood, perhaps on the average only half what is felled, often only a quarter or less, the rest remains lying on the ground and is generally burnt up by the forest fires. Thus, in case a careful management were introduced, and the area of forests did not steadily diminish, each acre must produce annually 100 cubic ft. and this is a very high yield.

If these figures are reliable, the production of wood must soon fall off and a crisis cannot be long delayed. One cannot, however, imagine, that any speedy alteration will be made in the present system of pillage and destruction of the forest. The time will come and cannot be much longer delayed, when the export of wood from the United States, which has steadily diminished of late, must altogether cease, and the import from Canada, already considerable, will be greatly increased. Many even consider it is not impossible that the export of wood from Europe to America will in time become profitable. The development of affairs will lead to a larger use of stone and iron instead of timber for buildings; whilst in many districts, coal will replace wood fuel, for at present three quarters of the total consumption of wood is for fuel. But, if the question progresses as rapidly as at present, the prices of wood must steadily increase and this is recognised on all sides. Laws against destruction of forests by fire have for a long time been in force in the different States, but have for the most part been

treated as a dead letter. In 1882, the American Forest Association was founded, which meets every year and has already done much to awaken interest in forest preservation in wide circles. In California, there is a State Board of Forestry, to arrest destruction of the forests, and in some of the Prairie States, already considerable areas have been planted out, extending to 100,000 acres in Dakota, and 1,000,000 acres in Nebraska. On the other hand we must not forget, that in other States, the forest area has become greatly contracted. For example, Ohio contained 54 per cent of Forest in 1856, and in 1887 only 16·69 per cent. From New York we learn that the Government of this State will undertake the proper management of the Forest region of the *Adirondacks* which, since 1886, has been under the protection of a special law and also that the President of the United States will take some decisive step towards forest protection, provided the state of the political parties will permit his doing so.

For the scientific observation of forests much has been done in the United States. The Central Government has published the excellent works of Sergent, and the publication of a new work 'The Sylva of North America' has just begun, which will set forth the description of North American trees in 12 quarto volumes with excellent illustrations. In the Museum of New York State, on the 15th of last November, the large collections of woods and forest products, known as the Jessup collection, was opened. Accounts of North American Forest regions are published in books and periodicals. The interests of the Timber Trade are dealt with in several periodicals some of which are well edited. Only one thing is wanting and that is indeed the chief point, an intelligent, permanent system of Forest management.

The Forest area, which still belongs to the Central Government, is estimated at 720 millions of acres, more than six times the area of all state and domain Forests in the German Empire. But for the present, the endeavour to become rich, rapidly carries the day. The wood speculator finds ways and means to fell wood in forests belonging to the States and to the Union, and the owner of private forests has not yet learnt that regular management may, indeed, give less produce at first than pillage, but that in a properly managed forest, a large wood capital collects which can at once yield a certain revenue, sure to increase steadily with the increasing prices of wood. Many wait for the State to commence and start regular management in its own forests. The State has, however, as yet hesitated to enforce its rights in its own forests with energy, partly from consideration for the wood merchants who are exploiting the forests regardless of consequences. By the law of homesteads, every American citizen can obtain 64 acres for a trifling stamp duty and just as much more for the small price of 1¼—2½ dollars an acre. Kessler relates that the Humboldt Redwood Company obtained 5,000 acres for 18 to 20,000 dollars by buying the

rights of settlers at the rate of 50 dollars a head. The value of the wood on this area has been estimated at 11 million dollars. But enormous masses of wood are felled every year on State lands without the shadow of a right. In the seven years from 1881 to 1887 the value of wood felled in this way, amounted to 36,719,935 dollars, of which only a small part, 478,000 dollars was recovered from the guilty parties.

The interests of the present are stronger than the care for the future. Whilst this is also the case in other countries, yet it has been possible to take care to ensure the rights of the future. When in India in 1856, energetic measures were taken to secure the rights of the State in the Teak forests of Pegu, and a proper forest management was introduced, the greatest possible dissatisfaction was shown by the merchants of Rangoon. It would have been a proper policy, they urged, to bring all mature timber to the market as soon as possible, so as to secure a rapid development to the young seaport. At one time it seemed as if the urgent petitions of the commercial people at Rangoon to the British East Indian Government, would be granted. Most fortunately, such a bad measure was avoided, the Teak forests were protected, a permanent well-regulated management was introduced, and it is now universally admitted that these thorough measures have greatly contributed to further the continual and rapid development of Rangoon.

In America also, in course of time, the rights of futurity will be protected. It is chiefly through Germans that successful forest management has been introduced into India and it is not impossible that before the import of German wood into America commences, skilful German Foresters will be invited to establish a rational forest utilization and a careful forest treatment into the United States. At present, however, the fulfilment of that idea lies in the distant future; and we must not forget that already in 1882, Bernhard Fernow in a letter from North America warned his fellow foresters in Germany not to build hopes on prospects in the United States. But in America, a change in affairs may come in a single night and signs are not wanting that such a change may before very long become possible. In a certain place in his book, p. 97, Mayr says, "At present the revenues of a properly managed forest would be very small and would not nearly defray the cost of management. Precisely because the commencement would involve a loss, the State appears to be specially designated to make a beginning; the time will soon come in which land stocked with forest will experience a similar rise in value as the once valueless Prairie." Whether the Federal Government, or that of separate States, will actually start the work, appears, as things are at present, very doubtful. It is not, however, impossible, that private forest owners will grasp the fact of the great advantage of careful forest management. With steadily rising prices for wood, the increasing capital value will

afford a more than sufficient compensation for the moderate revenue from a well managed forest. In another place, where he speaks of the Douglas fir, Dr. Mayr very properly says; "how 'well enterprise and capital might unite in a simple system 'based on a steady profit, to the blessing of the land and the 'profit of the speculator." It is not impossible that, in the United States, the private forest owner may first carry out this idea. The rapid growth of several of the most valuable woods of North America and the steady rise in the price of wood will render it possible to carry out careful forest management at a profit.

COOPER'S HILL COLLEGE, W. R. FISHER.
3rd May, 1891.

THE "THAN" TREE OF THE UPPER BURMA FORESTS.

Mr. Oliver, Conservator of Forests, Upper Burma, has lately sent me specimens of a new species of Terminalia which will shortly be figured in Hooker's Icones Plantarum as *Terminalia Oliveri*. Mr. H. C. Hill has given me some additional information concerning the appearance and geographical distribution of this interesting tree, which he has permitted me to incorporate in the following remarks.

The Burmese name is "Than," and the tree belongs to the section Pentaptera which by some Botanists has been regarded as a separate genus. The fruit is five winged, like that of the common *Terminalia tomentosa*, but much smaller. The leaves are sub-opposite, at least in the few specimens which I have, as yet, seen; and this circumstance, together with the small size of the fruit, explains why Government Officers in Burma were doubtful whether the tree should be classed under *Combretum* or under *Terminalia*. It has no petals: petals, however, are wanting also in *Combretum apetalum*, a Burmese species. Besides the absence of petals, the chief generic character of *Terminalia* is that the cotyledons are always convolute, whereas in most species of *Combretum* they are irregularly plaited or flat. The cotyledons of Than are spirally convolute, in the upper part of the seed being twisted around the radicula, which has about one third the length of the embryo. It stands very near to two species described by Presl from the Philippine Islands, *Terminalia passiflora*, with a two winged fruit and *polyantha*, the fruit of which has four, sometimes three wings.

Than is a moderate sized tree, attaining 40-50 ft. with a girth 4-5 ft. The stem is irregularly shaped, often channeled, somewhat like that of the Hornbeam of Europe. During the dry season the leaves turn red before falling. The bark, which is greenish grey, resembling that of *Anogeissus latifolia*, is thick and brittle. Its cells contain an abundance of starch and of calcium oxalate crystals, but apparently no tannin. The decoction of the bark gives a light colored extract, which has been largely used to adulterate Cutch, but is believed to be entirely ineffective as a tanning material.

Terminalia Oliveri is a very common tree in the dry region of Upper Burma, which commences on both sides of the Irrawaddy river, north of the 19th degree N. lat. and which extends as far as Mandalay and somewhat higher up in the Chindwin valley and in the country between the Chindwin and the Irrawaddy river. In this extensive dry region, which also comprises some of the land drained by the upper Sitang river, with a mean annual rainfall of only 20-30 inches, Than is associated with Cutch (*Acacia Catechu*) in a thin open forest, from which the Cutch, being the more valuable tree, has been much cut out. Other trees found in this forest are: *Tectona Hamiltoniana*, *Shorea Siamensis* (Ingyin) and (Taukyan) *Terminalia tomentosa*.

D. BRANDIS.

Bonn, July, 1891.

LORD WENLOCK ON THE FOREST POLICY OF BELLARY.

In reply to a petition presented to the Governor of Madras at Hospet, when on tour in the Bellary District, to the effect that the "relaxation of the Forest Laws and especially the free use 'of brushwood for sugar cane boiling and for agricultural 'purposes generally, are measures earnestly and widely desired," His Excellency Lord Wenlock replied as follows:—

"They had also asked for the relaxation of the forest laws as 'regards the use of brushwood for sugar cane boiling and agricul-'tural purposes. His Excellency was afraid on this point it was 'hardly possible for the Government to make exceptions in favour 'of one particular industry. He thought the sugar-cane industry 'hardly required any special prop or bolstering up by the Govern-'ment. He did not think it possible for the Government to relax 'any of the rules laid down by it. As regards local industry, he 'found on enquiry that the prices charged were the same which 'the Department charged in the other provinces. He did not

'think it would be possible to reduce them still lower for the sake 'of agricultural interests. If it were found possible to do so, he 'would like to see it done, but at the same time he felt bound to 'say that the Government had a difficult task before it in conserv-'ing the forests of the country. There was no doubt that unless 'matters were taken in hand in time, the whole forest would have 'been denuded both of fuel and fodder. At present he did not 'think it possible to relax the laws which were found necessary 'for the conservation of forests. His Excellency did not think a 'Government would be doing its duty if it did not do its best for 'the interests of the country and in the interests of those who came 'after them. To do so they must have revenue and it was found 'that they were obliged to charge certain fees and take certain 'privileges for acquiring a certain amount of forest produce which 'would eventually prove a source of enormous wealth to the people 'of the country. He looked forward to the time, not very far 'distant, he hoped, when the forest revenues would have grown 'so large as to enable the Government to reduce very largely the 'taxation which pressed so hardly on the subjects of the Queen in 'this country. He hoped that day was not far distant, perhaps in 'the life time of some of those assembled there. As matters stood 'at present he could only say it was difficult for the Government 'to relax any of the rules and regulations which were found neces-'sary to carry on the forestry of the country."

We are glad to see that Lord Wenlock has refused to give way in this case and has been able to explain so clearly to the petitioners, the forest policy of his Government, a policy which was inaugurated by his predecessor, Sir M. E. Grant Duff. The sugar cultivators are among the richest and most prosperous members of the agricultural community, and if among the cultivators on the rich and well irrigated banks of the Toongabudra there are any who can afford to pay fully for the forest produce they require, it is they. It may seem to those who do not know Bellary that the concession of free brushwood to poorer agriculturists might not only be graceful but be useful to the forests as allowing of cheap 'cleanings' of poor material, the brushwood taken in such cases being usually thorny bushes of Zizyphus, Canthium, Carissa and so on, which, if the other growth is good, may be usefully removed. But the fact is that in the neighbourhood of Hospet the Reserved Forests are of the poorest character as regards vegetation, and require chiefly the protection of all growth for a period of years to shelter the shoots and seedlings of the forest trees. With full protection for five to ten years, the Gound, Hospet, Jog, Tornagal, Billakal and Buckasagar Reserves, which now consist of bare hill-sides with a little grass and an occasional bush or stunted tree, or of piles of granitic boulders with a few pockets of soil and occasional shrubs, will change their character and fill up. They ought really to be walled or fenced to make sure of protection, and we think that the result would be such a growth of various kinds that after

a time, the yearly 'cleanings' which will be necessary to re-relieve the tree shoots will give plenty of good fencing material of the kind most in use in the country. But, as pointed out by Lord Wenlock, it is perfectly fair and just that the agriculturists for whose benefit the expense of forest protection and improvement is incurred, should contribute towards that expense by paying for the material they consume.

It is really wonderful what capabilities these dry stony Deccan hills have. In ravines, not far from Hospet, we have found patches of pure teak, which, in spite of yearly burning and yearly hacking, still comes up again and again; and with protection would give, if not timber, at any rate, material for small native houses and agricultural implements. Teak and Yegi (Pterocarpus Marsupium); Yepi (Hardwickia binata), Narudu (Dolichandrone crispa) with Gyrocarpus Jacquini, Terminalia tomentosa and Belerica and the male bamboo, may be expected to form the future forest, and there will, as in the neighbouring leased forests of Sandúr, be probably a fair sprinkling of sandal gradually introduced. We believe there are few forest works in India which so deserve to be watched with interest by Forest Officers as the work of gradually restoring and reclothing the barren hills of Bellary and Anantapur. Hitherto, Ajmere has been our type of excellent results, but much of the good done there has, as Mr. Hill recently told us, been counterbalanced by the evil effects of a too early opening to grazing. To judge by Lord Wenlock's speech, the Madras authorities may be trusted to avoid the Ajmere mistakes, and arrange for both necessities, the necessity of good pasture and that of cheap fuel and agricultural material in such a manner as to prevent the one necessity injuring the prospects of the other. The recent orders of the Government of India separating the 'pasture lands' from those required for 'fuel and fodder' shews that the distinction is intended to be maintained: and, if we mistake not, merely reproduces and applies more generally, what had already been applied under what is known in Madras as the 'Bellary scheme.'

REVISION OF THE FOREST LISTS.

We have received from the Inspector General of Forests copies of a Memorandum in which it is proposed to have these Lists only for the Government of India Provinces. We shall endeavour to review this shortly, but we may remark that our first impression certainly is that the old two lists for 'India' and Burma' respectively is more practicable.

A "BLAZER."

DEAR SIR,

I wish to suggest that Foresters should adopt a *blazer* in India. Anything of the kind has a distinct effect in promoting *esprit de corps*, and I think besides that it would be a useful thing, since everyone probably finds himself at some time in a position to use a blazer. Some details would have to be settled, such as who had the right to wear it, and the actual composition of the blazer. This last would be very easy, I imagine,—probably invisible green would be the main feature.

Cooper's Hill men just now are adopting a blazer, and some Forest Cooper's Hill men may have taken to that, but they would probably agree that they should subordinate Cooper's Hill to the Department, or they might go in for both.

Yours truly,
T.

We support our correspondent's suggestion and think that all that is necessary is to agree upon Colours. The Forest School at Dehra Dun has just adopted a blazer of dark blue with crimson edging and a badge of I. F. S. on the pocket. The same with some forest device might do for the Department generally. 'Invisible green' usually becomes very quickly and painfully 'visible' after exposure for some time to an Indian sun.

Hon. Ed.

AN INTERESTING NEW PRODUCT.

We have received form Mr McDonell, Conservator of Forests in Jummu, Kashmir, specimens of a composite plant locally called 'Kuth'; which we identify as *Saussurea Lappa*, Clarke. Our correspondent says that the plant grows at a high elevation, perhaps at from 9,000 to 10,000 feet. The root is dried and sells at as high a rate as Rs. 25 per maund. It is collected by villagers and paid for at Tehsils, and the chief purchaser is a Bombay Chinaman, but for what purpose he takes it to China is not known. It is a very interesting product and we shall be very glad of any help in elucidating the subject. In the flśra of British India, it is said to be supposed to be the 'Costus' of the ancients, largely used as a medicine in India, but that its properties have not yet been investigated. In Dr. Watt's Dictionary, under 'Costus,' we find it referred to as 'Kusht' or 'Kust,' and that it probably is in demand as a perfume similar to 'orris,' the scent produced from the roots of certain species of *Iris*, such as *I. florentina* and *I. germanica*. Doubtless, when Dr. Watt reaches *Saussurea* we shall have an epitome of information up to date. It must, of course, not be confounded with 'Costus speciosus.'

III. OFFICIAL PAPERS AND REVIEWS.

REPORTS ON FOREST ADMINISTRATION IN MADRAS AND BOMBAY DURING 1889-90.

These reports have just come to hand but though so late we must notice them, as they contain some interesting points. We do not purpose to criticize the work of the Department, for this has already been abundantly done in both cases, the Forest Reports of the minor Presidencies being rather more reviewed than are those of the Government of India Provinces.

In both Presidencies, Forest Settlement work is going on but slowly. However, if slow, it is apparently sure, for the Government of India "fully recognizes the exceptional accuracy and 'legal correctness of the Madras Forest Settlements and is 'satisfied that the indisputable title thus acquired over the State 'Forests is only safe foundation for their rational treatment" and from Bombay it is reported that the Reserved Forests which had been declared such under S. 34 and are now to be put through the mill of C. II and that the Protected Forests are to be gradually converted into Reserved, a procedure which the Government of India appears strongly to approve, considering that the chapter on Protected Forests was probably introduced into the Act, in order merely to meet temporary requirements.

The question of the large privileges granted in Bombay to villagers and of the measures proposed by the Government of Madras to meet similar customary licenses, have been more fully discussed by us in a separate article, in which we have expressed our satisfaction with the Madras scheme and noted the remarks of the Government of India on the Bombay Forest privileges, which advise that Government to consider "whether and to what 'extent the financial sacrifices due to the grant of privileges are 'justifiable." And we have referred to the statements of both Conservators that no 'rights' have been admitted at settlement except those of way and water. After the treatment of privileges the most important and noticeable point in the Bombay Forest Report for 1890-91 is that of the preparation of Working Plans, and the remarks made in the Bombay Report for the N. Circle will be read with interest by Working Plans officers elsewhere, who will probably hope that Mr. Fry or some one else will give us, in the pages of this Journal, some fuller and clearer information about how they are going to work. Apparently work has so far only been attempted in the Thana Disrict in 14 Ranges where about 1,140 square miles have been divided up into 303 Blocks and Compartments, the average area of a compartment being 50 acres. The rotation generally adopted, and apparently

calculated more or less by guesswork, is 40 years; so that as we understand it, what has been done is, calculating backwards, to make a large number of Blocks or Working Circles, each of 40 × 50 = 2,000 acres, which means 2,382 Working Circles for the administrative Northern Circle. It will be interesting to hear at times the result of this, but it seems to us that in order to carry out detailed operations not only of felling and exploitation but of improvement and protection over 2,382 working units, even the recent increase of staff is likely to be hopelessly inadequate. Mr. Shuttleworth gives the following explanation.

"The problem set to the Forest officers to solve was to 'arrange the working plans of the forest upon the bases:—

'(*a*) that local supply must be served by allowing to forest 'villagers and others as much rǎb material, in the shape of tree-'loppings, leaves, &c., as can be supplied; by providing grazing for 'village cattle; by providing labour and occupation in forests: and 'all these were to be given within a reasonable distance of in no 'case extending 4 miles beyond a forest villager's home;

'(*b*) that local trade must be encouraged and developed;

'(*c*) that the revenue legitimately obtainable from the forests 'should be realized;

'(*d*) that forests must be maintained: their capabilities being 'preserved and enhanced.

'In order then to comply with the conditions imposed by 'Government, it was necessary:

'(i.) to have the forest-blocks or working circles, French "*series*,' of restricted areas, so that the 4 miles maximum distance 'should be observed;

'(ii.) to have a large number of forest blocks. There are 1,331 'forest villages in the Thana Collectorate, their cultivation 'occupying the plains, while their forest areas about 1,250 square 'miles in aggregate, covering the hill ranges which are on the 'sides of the valleys and form the water-sheds, or divides of the 'drainage;

'(iii.) to have a large number of coupes in order that simul-'taneous exploitations should be spread over the whole forest 'region of the Thana District;

'(iv.) to determine a revolution which would give for the 'market the kind of timber in general demand, *viz.*, small timber, 'firewood and charcoal, which would allow selected trees to 'mature; which would provide as much branches with leaves 'attaching to them for rǎb as can be supplied; which would 'provide a sufficiency of grazing for village cattle; and which 'would at the same time keep the hill sides so well protected by 'tree-growth as to ensure the impounding of a torrential rainfall 'and the prevention of its off-flow in turbulent rush on to the rice 'fields in the cultivation areas below, with the removal of soil and 'other detritus, to impoverish the land and work other disastrous 'consequences."

The Government of India express themselves as satisfied that the small working circles are justified, but comment on the fact that all the forecasts are based on area instead of on material and advise the calculation of the possible yield. They further remark, "it is observed that the treatment generally applied to 'the forests which have been brought under systematic working, 'tends to create a system of coppice-under-standards. There can 'be no doubt that the future of the forests under such a form of 'treatment is, if the coupes are scrupulously closed for a consider-'able period, less affected by grazing than under a system of 'jardinage and restoration fellings, and it is possible that such 'treatment is justified under the favourable climatic conditions of 'the Thana District; but the same yield of material and revenue 'which would have resulted were the areas transformed into high 'forest can hardly be expected. Under any circumstances, it 'seems essential that the coupes should be closed against grazing 'for not less than 10 years to allow for the establishment of new 'saplings, without which forests under the treatment applied 'cannot but deteriorate. Considering the value of the Thana 'forests, the artificial re-stocking of blanks would also seem to 'recommend itself, and in order further to increase the future 'value of the forests, the Government of India are advised to 'recommend that groups of promising trees and saplings may be 'left, forming (so to say) patches of high forest."

We confess, that without attempting to express definite opinions on this scheme (for how can we do so without better knowledge of the locality and conditions) we cannot help thinking that the leap all at once into such minute subdivision and such intensive working as are required to carry it out, is too long a one, and that temporary simple plans for large areas so arranged as to secure the easy collection of the statistics and information regarding capabilities and growth which are necessary for every permanent working plan that is to be really successful would be better. We hope Mr. Shuttleworth or Mr. Fry will send us as a sample the Project of the Working Plan for some one selected specimen out of their 2,382 Working Circles.

In the Madras Report not much is said about Working Plans, but we gather that these which are in force are mostly plans of a temporary nature calculated to serve as we have above suggested that such plans should for the collection of the information upon which the permanent ones will be eventually based. It is noticeable that the results of the fellings of coppice over 95 acres in the Nilgiri Eucalyptus and Acacia Plantations gave 514,095 cubic feet or an average of about 5,400 cubic feet stacked per acre, equivalent to about 77 tons of solid wood. One of the coupes in Coonoor Peak gave as much as 16,600 cubic feet, equivalent, at 70 cubic feet per ton and 20 years average, to 11·8 tons per acre per annum, which is about what Mr. Hutchins estimated.

We regret to see that the relations between the Revenue and Forest authorities which seem to be good in Madras are by no means always so in Bombay, to judge by the remarks made by some of the Commissioners. Mr East, the Commissioner of the Central Division, referring to Mr. Shuttleworth's chapter on grazing says—

"The description of the barren rock tracts which constitute 'a large proportion of the Deccan grazing grounds as forests under 'regeneration and abounding in luxuriant vegetation is, to say the 'least, too highly coloured for the most part, and the large 'figures representing the number of cattle impounded suggest 'doubts whether the present system is not too violent a departure 'from old established custom. The entrustment of grazing interests 'to a department in its very nature hostile to them, can only 'be regarded as an experiment which should be carefully watched. 'The tendency of the department is, it cannot be doubted, 'to subordinate all interests to the growth of timber. A 'diminished supply of good milk, mutton and beef is a heavy 'price to pay for a few square miles, some decades hence of 'worthless scrub jungle. If the Forest Department had its 'way, it would abolish goats altogether and permit sheep to 'exist only on private land so far from forests as to be safe 'from straying into them. Before making over grazing land to 'the Forest Department it would be well if closer inquiry 'were held whether they could do any good with it, either 'directly by raising wood or indirectly by protecting the surface 'of the soil, in exposed situations. My sympathies are en-'tirely with the Forest Department, except where there is 'danger of its trenching on valuable sources of food-supply 'without profit to its own cause. The Conservator, in his 'remarks on the perversity of graziers, seems to forget that 'the so-called forests are artificial creations of yesterday, whilst 'as grazing grounds they have existed for generations, in a 'country which is notoriously conservative of ancient custom. 'Th v are frequently unrecognizable as forests in the common 'use of the term."

And Mr James, the Northern Division Commissioner, speaking of the ability, industry and devotion to Forestry of two Forest Officers, says :—

"If those gentlemen paid equal attention to carrying out the 'wishes and orders of Government as regards rayats' rights and 'privileges, the Commissioner would have still greater pleasure in 'commending them. Recent orders of Government will, it is hoped, 'go some way to the desired end. Undoubtedly one of the chief 'objects of the Forest Department is to bring people into discipline 'and convert vague and mischievous habits into method and order. 'But judgment is needed for enforcement of the rigid rules of 'French and German conservancy upon an Oriental people, and 'when privileges are being curtailed and brought under control

'as they must be, a loyal endeavour to meet admitted needs is 'likely to pay in the long run. Undoubtedly the Forest Depart-'ment have great difficulties for which allowance perhaps is not 'always sufficiently made, and they are bound to keep in view a 'high standard of conservancy, but a little more considerateness 'would, the Commissioner feels sure, tend much to reduce 'friction."

We quote these extracts merely with the remark that in all official business of the kind where two Departments, one of which looks almost solely to the present and the other almost equally solely to the future, come into contact, there must be considerable 'give and take' for few things are so hostile to progress as recrimination and unfair writing like that about the 'good mutton and beef' and the 'worthless scrub jungle.'

There are not many other matters to be noted in these reports. We see that the Kanara Saw Mills were closed in 1889, and that the tram lines in various districts of Madras are earning good opinions.

On the subject of *grazing* there is much of controversy in both Reports. To attempt to review in few words the opinions of the various authorities would take far too much space, so we shall content ourselves by extracting the following expression of the views of the Government of India from their review of the Madras Reports.

"The Government of India agree in the remark that the chief 'object of imposing a fee upon grazing is to limit the number of 'animals admitted into the State forests. In the opinion of the 'Governor General in Council, these fees should vary with the 'locality and the local value of pasturage, and as a rule, the 'number of animals grazed should be restricted to the number which 'the area can support with due regard to the production of timber or 'wood. Where a limit of number has been so fixed and moderate 'maximum fees have been laid down in the interests of the people, 'it would seem a matter of small importance whether the fees are 'realized by means of permits or by auction-sale. The latter 'method, however, might encourage the influx of herds from 'beyond the immediate neighbourhood to the exclusion of local 'cattle, and is consequently only desirable under exceptional 'circumstances, as when the area grazed is to be treated as a 'grass farm."

The notes on natural reproduction are usually interesting to the readers of the 'Forester.' The Madras Northern Circle Report refers to the excellent improvement in the growth of the Devancheru Reserve. A few years ago this was an area of poor dry laterite country covered with small thorny scrub and so browzed by goats as to present an almost hopeles appearance. It lies however quite close to the large town of Rajahmundry where the demand for fuel is large and 5,000 acres of it were reserved at the suggestion of a well-known late Collector, Mr. Foster. It was strongly

fenced at once with dry thorns and inspection paths were made, the result being a wonderfully quick improvement in the growth, so that now it is almost impenetrable in underwood and the better trees are fast shewing their heads through it. Other similar areas are being treated in the same way, so that we may expect shortly that the lower taluks of the Godavari, one of the richest agricultural countries in India, will have good, well defined coppice areas fit to supply small material in considerable amount.

The remarks regarding the reproduction of Hardwickia in Anantapur deserve quoting :—

" In Muchukota, where the soil is red and stony, and the main growth is *Hardwickia binata*, seedlings of *Hardwickia* still appear and die down in the hot weather. It is believed, however, that these seedlings do not all die, but that the roots of some perish ; and it is believed, that gradual improvement is going on. The old trees are vigorous. In the tract of Kottakota which has been surrounded by a wall of stone, the growth of trees of various kinds and the crop of seedlings are wonderfully good. Protection has been real and effective here. In the Amagondapolliem reserve, *Hardwickia* seedlings are coming on fairly."

The Report might have added that in one of the most barren of Reserves in India, that of Gootoor in the same District, the result of a stone wall round the boundary has been a promising growth of shoots, principally of the useful *Dolichandrone crispa*.

The Report of the Southern Circle of Madras has much of interest on the same subject, all of which it would take too much space to reproduce. The growth of sandal seedlings under bamboo on the Javadi Hills (North Arcot) is remarked on ; and the reproduction of Hardwickia in the Kollegál and Bhávani forests of Coimbatore is spoken of regretfully, as owing to imperfect fire protection the seedlings appear only to be yearly killed off again.

The following remarks on the reproduction of Sandal are worth quotation :—

" The sandal (*Santalum album*) is propagated by birds which ' swallow the entire fruit and drop the seed under the trees and ' bushes where they perch. 'Young sandal plants are to be found ' in every ravine and thicket in the sandalwood reserves of ' Kollegál but they are not so numerous as could be expected after ' 6 or 7 years of protection of those reserves. This is to a certain ' extent due to rank undergrowth which does not admit of sufficient ' light necessary for the young plants. The protection, moreover, ' has been by no means complete and both fire and cattle have ' entered repeatedly."

This agrees fully with our experience that sandal seedlings are almost never found in the open, but come up in great profusion under the shade of bushes and in hedgerows, and this may be seen even far away from the natural locality, as about Adyar in Madras itself.

On the question of the reproduction of Teak forests, one of the most important questions with which Indian Forest Officers have to deal, and one of those least definitely settled, the following remarks will be read with interest.

"The District Forest Officer, *South Coimbatore*, writes that 'in regard to natural reproduction and causes of failure in the 'high forest of his division, another year's observation only tends 'to corroborate the statements made in the last annual report. 'Mr. Porter finds that there is little or no "advance growth" of 'teak from seed in the Anamalai forests worked under the Jardinage 'system and considers that we must stimulate or assist reproduc-'tion by clearing away the undergrowth and rank grass which 'prevent the seeds from germinating or seedlings flourishing and 'by planting out seedlings from nurseries where necessary. The 'Conservator agrees with him and experiments in those directions 'will be undertaken during the current year."

The Report of the Southern Circle of Bombay seems to say that natural reproduction is generally good where protection from fire and grazing is possible; and that of the Northern Circle says the same.

"Natural reproduction is a mighty power available for re-'clothing forest estates, provided there is sufficient and seasonable 'rainfall and due care is taken to protect the areas against fire and 'the grazing of cattle, especially sheep and goats. In the two 'Thana Divisions, the coppice shoots that appeared in the coupes 'between August and December, had attained considerable 'dimensions by the hot weather. In the Karjat Taluka, coppice 'shoots of 3 and 4 years old have attained the height of 25 and 30 'feet with a diameter of 4 inches. In places where grazing is 'never allowed, seedlings of teak and blackwood have sprung up in 'abundance. In the two Khandesh Divisions, the reproduction by 'seed, supplemented by coppice shoots, was vigorous in closed 'forests and in places not traversed by fire."

The Sind Report, under this heading, points out how the growth diminishes according to the distance of the areas from the river. We quote the following as of interest on the subject.

"The working plan of the Sind Forests, probably already des-'cribed in former reports consists in the fencing in of compartments 'worked for fuel, and out of which cattle are excluded until the cop-'piceshoots and seedlings are of such growth as to escape being trod-'den down when buffaloes, cows and sheep are admitted, and after 'the tops of the young trees have attained a sufficient height to be 'free from harm—goats are then allowed to browse Attention has 'been paid to this duty, and with satisfactory results, as far as the 'river-side forests are concerned; but complaints have reached me 'with regard to a number of the areas acquired within recent years 'that are situated some distance from the river. The Divisional 'Forest Officer, Sukkur, remarks—"As the system of irrigation in 'Sind is by means of canals, it is necessary to point out how very

'desirable it is that forests should be given to us along the river 'bank where floods come," and "it is better under existing condi- 'tions to abandon those Belas far removed from the river which 'can be irrigated by canal agency only, and secure instead Belas 'on the river side." Again, "there is a large area of land in the 'Shikarpur range, the growth in which is getting small by degrees 'and beautifully less, and the state of which is rapidly deteriorat- 'ing into the condition of a desert." The Divisional Forest Officer, 'Naushahro, reports:—" If the closed blocks referred to in the 'foregoing two paras. do not get sufficient water, it is feared that 'they will be ruined soon." The forests in the other two Divisions 'are all, with only one or two exceptions, situated on the banks of 'the river, and are therefore under the influence of its floods. The 'above facts prove that I am right in the opinion I have already 'expressed to the effect that all new reserves should be selected 'from areas available on the river."

Under Artificial Reproduction, the most interesting point referred to in the Madras Northern Circle Report is the necessity for re-stocking parts of the Casuarina plantations in Nellore which have been cut, with indigenous trees, because it has been found that on the lands that have borne one crop, new plantings of casuarina are unsuccessful, probably because the first crop has drained the upper soil and consequently water is at a lower level below the surface. The seedlings planted around the wells grew strongly enough, but on the lands between, some other species is required. The 'neem' tree and 'Kurkapillai' (*Inga dulcis*) are expected to prove the best kinds. The success of the mahogany plantations at the foot of the Coonoor Ghat is encouraging, as, so far, it is one of the few places where the tree has been grown on at all a large scale. We understand that there are now nearly 200 acres of mahogany (*Swietenia Mahogani* and *macrophylla*) and that the largest of the planted trees reach 17 feet. We suspect that the '*Cassia Tora*' referred to as having been sown in the Ganjam coast plantations should have been '*Cassia Siamea*.' *C. Tora* is only a small roadside shrubby annual weed. In the Southern Circle Report it is recorded that at Nelambur teak and mahogany are being grown mixed and that 140 acres were stocked in this way with 152,974 teak and 1,492 mahogany. This means nearly 40 feet per tree at a distance apart of 5 feet by 8 feet. With the assistance of bamboo or of some common quick growing species as a nurse, the available seedlings would have sufficed for a larger area. Worthy of notice is the good work done in Malabar in the introduction of new bamboos. But we suspect that the 'Giant bamboo' referred to as *Dendocalamus Brandisii* is not *Bambusa Brandisii* of Burma, but the splendid *Dendocalamus giganteus* of Penang which is much cultivated in Burma, and is the giant bamboo of the Calcutta, Madras and Peradeniya gardens. The 'Golden *Burma* bamboos' are probably the golden variety of

Bambusa vulgaris and if so, their native country is China and not Burma. *Dendocalamus longispathus* and *Cephalostachyum pergracile* are reported to thrive and will be valuable introductions, but *Beesha (Ochlandra) trovancorica* is more interesting botanically than it is likely to be as an economic plant.

We recommend the valuable 'notes on exotics' in both Circle Reports as well worthy of attention and full of interest.

We may conclude our notice of these interesting Reports by giving the Revenue and Expenditure of the year. These were :—

	Revenue	*Expenditure*	*Surplus.*
Madras	15,57,627	11,65,358	3,92,259
Bombay	31,37,978	17,65,159	13,72,819

We are glad to see that the Madras Board of Revenue considers it "preferable to invest a far larger proportion of the receipts 'in roads, buildings, fire lines, &c., and to increase the efficiency of 'the staff, than to merely pay it over to general funds as surplus." This enlighted policy deserves to find imitators: if our forests in India are ever to be the magnificent and valuable estate they ought to prove and can be made, capital expenditure must be devoted to works of protection and improvement, and we believe that no policy is so bad as that of calling for the maximum of net revenue while the communications of the forests are still in a primitive condition and the staff ridiculously insufficient for proper protection and management.

GOOD CONDUCT BADGES OR MEDALS FOR FOREST SUBORDINATES.

In a recent circular the Government of India has had under consideration a proposal to grant some decoration or distinction to Forest Subordinates as a reward for approved service and good conduct, and have circulated their views for the opinions of the various Local Governments. They say. "The Government of 'India considers that there are objections to the use of medals, 'stars or any other military form of decoration by officials in Civil 'Departments; and if Local Governments and Administrations 'are agreed as to the desirability of introducing a system of good-'conduct awards for Upper Subordinates of the Forest Depart-'ment, I am to ask what form of decoration or distinction would 'be considered suitable. Stripes on the sleeves are considered 'suitable for officials below the rank of Rangers. For officers of 'higher position, bangles have been suggested or some gold or 'silver worked design on either the collar or shoulder straps of the 'uniform—such as oak leaves, or other symbol emblematical of the 'Forest Service"

We hope that the result will be satisfactory, the prospect of marks of distinction for specially good service cannot but tend to help in getting better candidates and honester men.

CROP EXPERIMENTS IN ASSAM.

We have received the Annual Note on crop experiments carried out in Assam in 1890-91 on rice, sugarcane, and other crops. We gather that of the rice known as 'Sali' the average yield per acre in the Assam Valley determined from 2,942 experiments made over 976·85 acres amounted to somewhat over 19 mds. That of 'ahú' came to about 17 maunds, as did the average yield of 'bao.' In Sylhet the outturn of all experiments was 19 maunds, while only 15 were obtained in Cachar. The experiments in sugarcane resulted in shewing the following net results.

(1). The yield of 'Gúr' is 1,400 lbs. per acre.

(2). Cane gives 47·24 per cent of its weight of juice and, 8·15 per cent of its weight of 'Gúr.'

The average yield of linseed per acre is 444 lbs, that of rape 325 lbs, that of cotton 307 lbs, that of 'Til' or gingelly 266 lbs that of jute 1,077 lbs, onions 1,625 lbs, potatoes 1,769 lbs and tobacco 625 lbs, results which seem to us to afford useful and interesting statistics.

CHEAP QUININE.

In reviewing the Annual Report of the Darjeeling Cinchona Plantations for 1890-91, the Lieutenant Governor of Bengal says: "The net profit of the year's working amounts to Rs. 17,040-2, a 'result which may be considered as satisfactory and quite sufficient. 'It must be remembered that in starting the cinchona plantations 'in this country, the Government did not aim at a profit: its 'object was to secure for the people a cheap remedy for fever, the 'commonest of all tropical diseases The quinine manufactured 'at the Government Factory can now be sold at one rupee per 'ounce, while as Dr. King remarks, quinine cost a good many 'rupees per ounce 29 years ago, when the cinchona enterprize was 'initiated by the Government of Bengal. This is a matter for 'much congratulation. Hardly any greater blessing to a fever-'stricken country can be imagined than cheap quinine. Dr. King 'observes that it would be possible still further to reduce the price 'of quinine if all the charitable dispensaries in the province were 'to supply themselves with the Government drug instead of buying 'their quinine elsewhere. The Lieutenant-Governor has ascertain-'ed by personal enquiry, since Dr. King's report drew his attention 'to the subject, that many dispensaries procure their quinine from 'private stores Re. 1-2 and Re. 1-4 per ounce, when they could 'purchase it from Dr. King at Re. 1 per ounce. This is an obvious 'absurdity. Not only is the Government quinine declared to 'be purer than much of the foreign quinine imported into 'the country, but also it is only reasonable that institutions helped 'by Government should draw their supplies of quinine from the 'Government Factory, and the Inspector-General of Civil Hospitals 'will be asked to look into the matter and consider what can be 'done to extend the demand for Government quinine in order to 'bring about a further reduction of price."

IV. TIMBER MARKET.

CHURCHILL AND SIM'S CIRCULAR

of September 3rd, 1891.

EAST INDIAN TEAK.—There has been a considerable falling away in the volume of business in London during the months, the deliveries having only amounted to 868 loads against 1,801 and 1,872 loads in August, 1890 and 1889 respectively. For the eight months the deliveries have been 9,841 loads in 1891, 10,886 loads in 1890, and 10,907 loads in 1889. The reduction in the visible supply continues large, and while sellers are inclined to ask higher prices for floating cargoes, buyers are more ready to enter into fresh business at those recently current.

BOXWOOD.—PERSIAN and ABASIAN.—Stocks are low and supplies wanted. AFRICAN.—There is no stock, and early arrivals would find a ready sale.

PRICES.

Indian Teak	per load	...	£2	to	£14
Satinwood	per ton	...	£6	to	£10
Rosewood	per ton	.	£6	to	£10
Ebony	per ton	...	£10	to	£12
Boxwood	per ton	...	£4	to	£13

V. NOTES QUERIES AND EXTRACTS.

BRAVERY OF A FOREST OFFICER.

We extract from the '*Pioneer*' the following account of an episode in the recent floods at Narsingpur. The Swedish Missionary's house is situated on a knoll close to the stream, and it was completely cut off by the water. Fearing that the water might rise higher and sweep it away, the District Superintendent of Police and the Forest Officer, Messrs. McIver and Caccia, hurried down to the spot and managed to bring Mr. and Mrs. Lindroth and their children over safely in a tonga. Some servants had, however, been left behind, and seeing this Mr. McIver sent for ropes, the water having risen so fast and so high that there was no other way of getting across. Seeing these men in peril, Mr. Caccia dashed into the stream, fully clothed, but had not reached the middle of the stream before he was swept away. Being encumbered by his waterproof he would infallibly have been drowned, had he not been swept into the branches of a tree, to which he clung. On arrival of the ropes he and the four servants were rescued by means of a rope tied round the waist of a strong swimmer, a punkha coolie, who swam across and tied the rope to the tree.

DEODAR CONING IN ENGLAND.

Reverting to this subject, we may note that the earliest record we can find of the Deodar coning in Europe is of one that fruited in 1852, at Mr Kell Barclay's, at Bury Hill, near Dorking, as recorded in our columns, September 11, 1852, p. 582 The tree was at that time 28 feet high. We should be glad to know its further history. Since then it has fruited at Dropmore, Kew, Sunninghill, and other places. Sir Joseph Hooker kindly reminds us that at Kew there is a specimen tree which was a seedling raised by the late Sir Thomas Acland from a cone produced at Killerton, near Exeter. The tree is more vigorous than many of the Deodars grown at Kew, the species not thriving well in the Royal Gardens. Writing from Bicton in our columns in December 11, 1869, Mr James Barnes, says :—" I have not yet seen a tree ' above fifty years old or more than 80 feet high, though I ' have known it to produce cones for years; and have seen per- ' fect seed produced from home-grown plants, as well as plants ' raised from home-grown seed."—*Gardener's Chronicle.*

TASMANIAN TIMBERS.

Among the important trees of Tasmania is the "blue gum" which has its home principally in the southern parts of Tasmania. Many of these trees exceed a height of 280 ft., with a girth of from 40 to 50 ft. The timber of the blue gum is of rather a pale colour hard, heavy, strong, and durable. In transverse strain its strength is about equal to English oak. It is used in house and ship-building, and also by carriage builders and manufacturers of tools. The timber of the peppermint tree is useful for many kinds of carpenters' work ; in drying it does not split. It is also used in shipbuilding. The "stringy bark gum" is a valuable tree, found in abundance in Tasmania. The wood supplies a large portion of the ordinary sawn hard timber for rough building purposes. It is also well adapted for carriage, cart, and wagon-building, wheelwork, and agricultural machinery, as well as for the framing of railway carriages and trucks. The timber of the "white gum" or "manna tree," is used for shingles, rails, and rough building materials. The "iron bark" is a valuable tree, the trunk of which is sawn into good timber, it is also used for posts and rails. One of the most handsome of the native trees is the ' blackwood," which is widely distributed along the slopes of the north-west coast. The timber is of a brownish colour, closely striped with streaks of various shades of a reddish brown. The more ornamented logs of this wood are exceedingly beautiful, and fetch a high price. The myrtle or beech is common in Tasmania, and forms a large proportion of the forests. The "huon" pine is said to be the grandest and most useful of all the

soft woods. It is abundant along the rivers of the south-western parts of the island, attaining a height of from 60 to 120 ft., with a diameter from 3 to 8 ft. It is largely employed, locally, for all kinds of furniture and ornamental work, and is the most highly-esteemed of all kinds of wood for the lighter sea craft. The value of Tasmanian bark and timber exported during the last five years amounted £627,361, or an average of about £125,472 a year. This, says the *Journal of the Society of Arts*, represents nearly one-eleventh of the total exports.—*Timber Trades Journal.*

AN INTERESTING FOSSIL.

The other morning the navvies working at the deep cutting of the Crieff and Comrie Railway, at the west side of the town, came upon a curious heavy stone lying about 8 ft. below the surface of the ground. On examination, it seemed to have been a root-cutting of a tree nearly a foot in length, having a diameter at the lower end of 7 in., and at the top of 5 in. The lower-end appears as if cut with an axe or some such instrument, and the top has every appearance of being cut with a saw, and is quite smooth. The various yearly growths are distinctly visible at the smooth end. An experienced wood merchant is of opinion that it is the cutting of a laburnum tree. It is much heavier than a stone of the same size would be.—*Ibid.*

THE MANNER OF MANNA.

In an Occasional Note which we published on the 17th instant it was remarked that " the manna which fell from the sky during a shower near Merdui and Diarbekir, in Asia Minor, last August, and was baked into bread, has been examined by French men of science. It is in the form of little balls or hailstones, yellow outside and white within, and is identified as a lichen belonging to the species *Lecanora esculenta.* The lichen is found in Algeria, but is common on the arid mountains of Tartary and the Kirghiz Desert." A correspondent who read the note has kindly sent us some manna for inspection. In doing so he writes :— " Perhaps you would like to see some of it ? So I enclose a small quantity. As to manna it does occasionally fall in the form of snow in the vicinity of Mardin, as I have repeatedly been assured by competent and trustworthy witnesses. I also tested it ; but it is totally different from the recent fall in colour, form and taste. The former assimilates what we would realise the scriptural manna to have been like." The sample resembles Plaster of Paris, the shape and colour being the same as described in the note above. Curiously enough, the same post brought us a recently published *brochure* on the chemical properties of mannas from

the pen of Mr. David Hooper, F. C. S., the Madras Government Quinologist. It is written in scientific phraseology, and though it affords a deal of information on this interesting subject from the chemist's point of view, it does not condescend to go into those details which the "general reader" is in need of.

It is as well to disabuse one's mind at once of the idea that there is anything miraculous about manna. Doubtless the passage in the Old Testament, describing how this "angels' food" was rained down from heaven to keep from starvation the wandering Israelites, pre-supposes the idea that a miracle was performed thereby, but the miracle, if any, was with respect to the quantity of food provided rather than to the substance of the food itself. Mannas (for there are several varieties) are simply concrete exudations from plants and trees and they are found more conspicuously in the following species:—Ash, cotoneaster, tamarisk, camelthorn, eucalyptus, oak, plantain, willow, cedar, larch and pine. The manna of the Israelites, according to some authorities, was obtained from the tamarisk shrub, according to others from the camelthorn It may well have been obtained from both. Tamarisk manna is called by the Persians guz-angubin or tamarisk honey. It exudes during the day time in the hot months of June and July, from the slender branches of the plant, in the form of honey-like drops which in the cool of the morning are found in a solid state. Ehrenberg discovered that the exudation of this manna is caused by insects of the genus Coccus which sometimes cover the branches. At the present day it is eaten by the Arabs and by the monks of Mount Sinai like honey with their bread. The camelthorn (or alhagi) manna is called by the Persians *tar-angubin*. The plant from which it exudes is small, and leguminous, growing commonly enough in Persia, Afghanistan and Beluchistan. The manna occurs in the form of small, roundish, hard, dry tears varying in size from a mustard seed to that of a coriander, of light brown colour, sweet taste and senna-like odour. It is collected near Candahar and Herat and imported into India from Cabul and Candahar to the extent of about 2,000 lbs annually, and is valued at about thirty shillings a pound. Though each of these two kinds of manna has claims to be considered identical with the manna of the Israelites, we cannot help thinking that at least one other kind has equal claims. This is the manna lichen mentioned above, which is found in more or less abundance in every desert place between Algiers and Tartary. The *Lecanora esculenta* is a plant that trails along the ground in layers of three to six inches thick over large tracts of country, and the position of its manna on the ground tallies with that mentioned in the Bible narrative.

The manna best known in Indian Bazaars is "Shirkhist," derived from the *Cotoneaster nummularia* and chiefly imported, we believe, from Afghanistan and Turkestan. It is curious that its chemistry had not been correctly ascertained until the year

before last, when M. Raby examined an authentic specimen from Persia. The author of *Makhzan-el-Adwiya*, speaking of shirkhist, says "they say that in the town of the Subbah of Behar and Patna and Bhagalpore; a substance like shirkhist is obtained from a plant called in Hindi, *katra*, and they prepare it in this manner. The tree is cut down and fire applied to the roots, which causes a flow of boiling juice which concretes into lumps like white sugar sweetmeats, and this sugar has all the properties of shirkist, and it is called by the people of those parts "*harlalu*." Of another kind of manna, Mr. Hooper writes as follows:—"The pines and the cedars in the Himalayas have this year been thickly covered with manna, and Dr. G. Watt last February supplied some of the young branches of *Pinus excelsa* coated with a white saccharine exudation matting together the acicular leaves. The manna was whitish, opaque, soft and clammy to the touch before it was dried, odourless and sweet." There is no necessity to describe in detail the numerous other kinds of mannas. Amongst them may be mentioned the commercial manna from the *frassinetti*, or plantations of Sicily, which is useful for its medicinal properties; Ispahani manna derived from the *Astragalus florulentus*; oak manna derived from the twigs of the *Quercus persica*, which is an object of some industry among the tribes of Kurdistan at the present day; Laristan manna which oozes from the *Pyrus glabra*; Australian eucalyptus manna, which is such a favorite sweetmeat with the children of that country; and the *manna de Briançon* or Birgantina, collected from the larches grown on the French Alps. *(Indian Agriculturist.)*

NATIONAL SCHOOL OF FORESTRY.

At the recent annual meeting of the Association of Chambers of Commerce Mr. G T. Harper, J P. (Southampton), moved:—"To confirm the resolutions passed at previous meetings of the Association of Chambers of Commerce, that it is desirable that a School of Forestry should be established for the United Kingdom, and again represent to the Right Hon. the President of the Board of Agriculture the desirability of such an establishment." He said that England was the only great civilised country in the world that had no School of Forestry. In Germany, Nature aided by Science and Art had produced the greatest possible effect for sterile land; and in France, a sterile desert—inhabited only by shepherds, and almost uninhabitable by them—had been rendered productive, and its character completely changed. The South of Scotland delegates had asked for a Royal Commission in favour of the Forth Canal. He did not ask for a Royal Commission, because a series of Royal Commissions had already sat. The last commenced its labours in 1885, sat again in 1886, and terminated its labours in 1887. He had hoped Sir John Lubbock, who presided over that Commission, would have been

VI.—Extracts from Official Gazettes.

1.—Gazette of India.—

12th August 1891.—*No.* 926F.—Mr. J. Nisbet, Deputy Conservator of Forests, 2nd grade, Burma, is appointed to officiate as a Conservator of the 3rd grade, in charge of the Upper Burma Circle, during the absence on three months' privilege leave of Mr. J. W. Oliver, Officiating 3rd Grade Conservator, with effect from the 6th August 1891.

10th September 1891.—*No.* 1024-F.—With reference to the Notifications of this Department, No. 621-F., dated the 26th May, 1891, and No 739 F., dated the 26th June 1891, Mr. J. T. Jellicoe, Officiating Conservator of Forests, 3rd Grade, Assam, reverted his substantive appointment of Deputy Conservator, 1st Grade, on the 1st September 1891.

Mr. J. McKee, Deputy Conservator of Forests, 2nd (officiating 1st) Grade, Coorg is appointed to officiate as a Conservator of the 3rd Grade and to hold charge of the Assam Forest Circle, with effect from the 1st September 1891, and until further orders

18th September 1891.—*No.* 1038-F.—With reference to the Notification of this Department, No. 627-F., dated the 1st June last, a Conservatorship vacant on the Imperial List having been placed at the disposal of the Government of the North-Western Provinces and Oudh from the 10th July to the 3rd August 1891, Mr. W. Shakespear continued to officiate as a Conservator, 3rd Grade, for that period, and reverted to his substantive appointment of Deputy Conservator, 2nd Grade, on the 4th August 1891.

23rd September 1891.—*No.* 1972—6-*M. & Ex.*—The services of Mr. E. C. Cotes, First Assistant to the Superintendent of the Indian Museum, are transferred to the Forest School at Dehra Dun for two months, with effect from 1st September 1891.

24th September 1891.—*No.* 1,060 F.—With reference to the Notifications of this Department, No. 994-F., dated the 20th September 1889, and No. 905.F., dated the 7th August 1891, Colonel J. C. Doveton, M.S.C., Conservator of Forests, 1st Grade, on return from furlough, assumed charge of the Southern Circle in the Central Provinces from Mr. R. H. E. Thompson on the forenoon of the 16th September 1891.

29th September 1891.—*No.* 1,105-F.—Consequent on the retirement from the service of Mr. C. J. Ponsonby, Deputy Conservator of Forests, 1st Grade, North-Western Provinces and Oudh, Mr. E. McA, Moir, Deputy Conservator, 2nd (Officiating 1st) Grade is confirmed in the latter appointment, with effect from 14th February 1891.

2.—MADRAS GAZETTE.—

3rd September 1891.—The undermentioned officers have passed the prescribed examination in Forest Law and Revenue.

Name.	Designation.	Test.	Date of passing.
Mr. Claude du Pré Thornton.	Assistant Conservator of Forests, Third Grade.	Forest Law ...	20th July, 1891 ...
Mr. A. B. Jackson...	Do. do. ...	Forest Revenue...	20th and 21st July, 1891.
Mr. F. Foulkes ...	Do. do. ...	Do. ...	Do. ...
Mr. H. B. Bryant ...	Do. do. ...	Do. ...	Do. ...
Mr. R. McIntosh ...	Do. do. ...	Do. ...	Do. ...

7th September 1891.—*No.* 397.—Mr. C. E. Brasier, Deputy Conservator of Forests, Madras, has been permitted by the Right Honorable the Secretary of State for India to return to duty within the period of his leave.

9th September 1891.—*Leave.*—The Board of Revenue (Land Revenue) has granted one months' privilege leave, under article 291 of the Civil Service Regulations, to M. R. Ry. V. Alwar Chetty Garu, District Forest Officer of Kistna.

11th September 1891.—*No.* 392.—Mr. C. Somers Smith, Assistant Conservator of Forests, Madras, has been granted by the Right Honorable the Secretary of State for India an extension of two months' extraordinary leave on medical certificate, without pay, in continuation of the leave notified at page 753, Part I of the *Fort St. George Gazette* dated 21st July 1891.

12th September 1891.—*Confirmation.*—Mr. A. M. Clay, Ranger, Fifth Grade, acting sub. *pro tem.*, is confirmed in that grade.

22nd September 1891.—*Leave.*—Ranger Mr. Noronha is granted 15 days' leave in extension of that notified at page 1080, Part II, of the *Fort St. George Gazette* dated 21st July 1891.

24th September 1891—*No.* 424.—

Name.	Present Grade.	Grade to which promoted.	Nature of promotion.	With effect from
Mr. H. A. Gass...	Deputy Conservator of Forests, Second Grade.	Deputy Conservator of Forests, First Grade.	Acting	7th July, 1891.
Mr. A. W. C. Stanbrough.	Deputy Conservator of Forests, Third Grade.	Deputy Conservator of Forests, Second Grade.	Do. ...	Do. ...
Mr. F. A. Lodge	Assistant Conservator of Forests, First Grade, and Acting Deputy Conservator, Fourth Grade.	Deputy Conservator of Forests, Third Grade.	Do. ...	Do. ...

28th September 1891.—*No.* 420.—Mr. H. H. Ward, Sub-Assistant Conservator of Forests, Second Class, Kurnool, to act as District Forest Officer, Godavari, *vice* Mr. A. W. Lushington on leave, or until further orders.

3.—BOMBAY GAZETTE.

15th September, 1891.—*No* 6334.—His Excellency the Governor in Council is pleased to appoint Mr. G. A. Hight to hold charge of the Forest Division of Belgaum, on Mr. Murray's departure on leave, in addition to his own Division, Dhárwár, pending further orders.

26th September 1891.—*No.* 3367.—Mr. R. P. Ryan, Assistant Conservator of Forests, First Grade, and Divisional Forest Officer, Bijápur, is allowed privilege leave of absence for twenty days.

28th September 1891.—*No.* 6653.—His Excellency the Governor in Council is pleased to appoint Mr. G. A. Hight to hold charge of the Forest Division of Bijápur, in addition to his lown Division, Dhárwár, during the absence of Mr. R. P. Ryan on privilege leave or pending urther orders.

4.—BENGAL GAZETTE.

The 11th September, 1891.—Consequent on the confirmation of Mr. C. G. Rogers, Assistant Conservator of Forests, first grade, as Inspector at the Dehra Forest School, the following promotion is ordered with effect from the 26th February 1891 :—

Mr. H. D. D. French, Assistant Conservator of Forests, second grade, and officiating Deputy Conservator of Forests, fourth grade, to be Assistant Conservator of Forests, first grade ; but to continue to to officiate as Deputy Conservator of Forests, fourth grade, until further orders.

Consequent on the grant of nine months' leave on medical certificate out of India to Mr. M. S. Fowler, Deputy Conservator of Forests, fourth grade and officiating Deputy Conservator of Forests, third grade, with effect from the 2nd July 1891, the following temporary promotion is ordered from that date :—

Mr. R. L. Heinig, Assistant Conservator of Forests, first grade. and Officiating Deputy Conservator of Forests, fourth grade, to officiate as Deputy Conservator of Forests, third grade.

Consequent on the death of Mr. M. S. Fowler, Deputy Conservator of Forests, fourth grade, the following promotions are ordered with effect from the 31st July 1891 :—

Mr. R. L. Heinig, Assistant Conservator of Forests, first grade, and officiating Deputy Conservator of Forests, third grade, to be Deputy Conservator of Forests, fourth grade ; but to continue to officiate as a Deputy Conservator of Forests, third grade, until further orders.

Mr. H. H. Haines, Assistant Conservator of Forests, second grade, and Officiating Deputy Conservator of Forests, fourth grade, to be Assistant Conservator of Forests, first grade, but to continue to officiate as Deputy Conservator of Forests, fourth grade, until fourth orders.

Consequent on the return of Mr. W. M. Green, Deputy Conservator of Forests, third grade, from the leave granted him in the notifica-

tion, dated 24th April 1891, the following reversions are ordered with effect from the 9th August 1891 :—

Mr. R. L. Heinig, Officiating Deputy Conservator of Forests, third grade, to revert to his substantive appointment of Deputy Conservator of Forests, fourth grade.

Mr. H. H. Haines, Officiating Deputy Conservator of Forests, fourth grade, to revert to his substantive appointment of Assistant Conservator of Forests, first grade.

15th September, 1891.—The following transfers and postings of officers are hereby ordered :—

Mr. W. M. Green, Deputy Conservator of Forests, on return from the privilege leave granted him in the Notification of this Department, dated 24th April, 1891, to the charge of both the Julpigoree and Buxa Divisions, until relieved of the latter by Mr. G. A. Richardson, Deputy Conservator of Forests.

Babu Sreedhur Chuckerbutty, Sub-Assistant Conservator, on being relieved of the charge of the Julpigoree and Buxa Divisions by Mr. Green, to the charge of the Pooree Division.

Mr. G. A. Richardson, Deputy Conservator of Forests, on being relieved of the charge of the Pooree Division by Babu Sreedhur Chuckerbutty, to the charge of the Buxa Division.

Mr. E. E. Slane, Sub-Assistant Conservator, on return from the privilege leave granted him in the Notification of this Department, dated 31st May, 1891, is transferred to the Darjeeling Division.

5.—NORTH WESTERN PROVINCES AND OUDH GAZETTE.—

2nd September 1891.—*No.* 4171.—The undermentioned officer has been granted by Her Majesty's Secretary of State for India extension of leave :—

Mr. C. Bagshawe, Conservator of Forests N.-W. Provinces, 12 months furlough.

11th September.—*No.* 4358.—Mr. B. B. Osmaston, Officiating Deputy Conservator of Forests, on special duty in connection with the preparation of working plans in the Central Circle, to the charge of the Ganges Forest Division, Central Circle, with effect from the afternoon of 27th June 1891, the date of his relieving Mr. A. Smythies.

14th September 1891.—*No.* 4420.—Mr. E. L. Haslett, Sub-Assistant Conservator of Forests, is attached to the Naini Tal Forest Division of the Central Circle from the 1st September to the 31st October 1891.

23rd September 1891.—*No.* 4746.—Mr. F. B. Bryant, Deputy Conservator of Forests, Naini Tal Division, furlough out of India for one year, with effect from the 1st November 1891, or subsequent date.

6.—PUNJAB GAZETTE.—

9th September 1891.—*No.* 318.—Mr. A. M. Reuther, Deputy Conservator of Forests, on return from the three months' privilege leave granted in Punjab Government Notification No. 127, dated the 21st March 1891, received charge of the Hazára Division from Mr. E. R. Murray, Assistant Conservator of Forests, on the forenoon of the 7th August 1891.

15th September 1891.—*No.* 329.—The furlough granted to Mr. E. Forrest, Deputy Conservator of Forests, Punjab, by Notification No. 173, dated 14th June 1890, has been extended by Her Majesty's Secretary of State for India till the 30th of November 1891.

No. 331.—Mr. C. F. Rossiter, Sub-Assistant Conservator of Forests, received charge of the Mongomery Division from Mr.. L. Gisborne Smith, Deputy Conservator of Forests, Direction Division, on the forenoon of the 25th August 1891.

7.—CENTRAL PROVINCES GAZETTE.—

5th August 1891.—*No.* 48.—Syed Alimuttaki, Forest, Ranger in the Jubbulpore Forest Division, is granted two and half months' privilege leave, with effect from the 10th instan, and availed himself of the same from that date.

20th August 1891.—*No.* 49.—Mahomed Yaseen, Forest Ranger 3rd grade, of the Betul Forest Division, is promoted to Forest Ranger, 2nd grade, with effect from the 1st August 1891.

3rd September.—*No.* 6347.—Mr. W. P. Thomas, Deputy Conservator of Forests, 2nd grade, is appointed to officiate as Deputy Conservator of Forests, 1st grade, with effect from the 12th April 1891, *vice* Mr. F. B. Dickinson.

9th September.—*No.* 6457.—Mr. A. M. F. Caccia, Assistant Conservator of Forests of the 3rd grade, is promoted to the 2nd grade of Assistant Conservators, with effect from the 13th July 1891.

10th September.—*No.* 6506.—On his return from the three months' leave on medical certificate granted him by Notification No. 3564, dated the 16th June last Mr. Chunder Kumar Chatterji, Sub-Assistant Conservator of Forests, is posted to the Hoshangabad Forest Division.

No. 6507.—Mr. Chunder Kumar Chatterji, Sub-Assistant Conservator of Forests, returned from leave; and, with reference to Notification No. 6506, dated the 10th instant, assumed charge of his duties in the Hoshangabad Forest Division on the forenoon of the 1st idem.

25th September.—*No.* 6632.—Mr. G. H. Taylor, Deputy Conservator of Forests, whose services have been placed at the disposal of the Chief Commissioner, Central Provinces, is posted to the charge of the Nimar Forest Division.

Mr. Taylor assumed charge of the Nimar Forest Division, from the Deputy Commissioner, on the forenoon of the 20th August 1891.

22nd September.—*No.* 6798.—Colonel J. C. Doveton, Conservator of Forests, Southern Circle, Central Provinces, reported his arrival at Bombay, on return from furlough, on the 13th instant.

Colonel Doveton assumed charge of the Southern Circle, from Mr. R. H. E. Thompson, Officiating Conservator of Forests, on the forenoon of the 16th idem.

8.—BURMA GAZETTE.—

27th August 1891.—*No.* 179.—The following promotions are ordered :—

With effect from the 29th April 1891 :

Mr. C. R. Dun, Assistant Conservator of Forests, 3rd grade, to be Assistant Conservator, 2nd grade.

With effect from the 1st June 1891 :

Mr. W. T. T McHarg, Assistant Conservatorof Forests, 3rd grade, to be Assistant Conservator, 2nd grade.

No. 180.—In the exercise of the powers conferred by section 34 of the Upper Burma Forest Regulation, 1887, the Chief Commissioner directs that the following rule shall be added to the rules published in Revenue Department Notification No 69, dated the 11th April 1889:—

(16*d*) The following rules are prescribed for the tapping of India-rubber trees in the Bhamo and Upper Chindwin districts :—

Trees may be tapped only during the months of December, January, February, and March. The roots of the trees and the lowest part of the stem within 3 feet from the surface of the ground may not be tapped and no India-rubber trees may be felled, burnt, or lopped. The incisions must be not less than 2 feet apart and must not exceed 1 foot in length and 4 inches in breadth.

5th September 1891.—*No.* 198.—At the departmental examination held at Rangoon, and outstations on the 1st June 1891 the following officers passed the examination in Forest Law and Revenue :—

Mr. Joseph Messer, Assistant Conservator.

Mr. W. T. T. McHarg, Assistant Conservator.

Mr. E. M. Buchanan, Sub-Assistant Conservator.

1st September 1891.—*No.* 13.—With reference to Revenue Department Notification No. 119 (Forests), dated the 16th June 1891, Mr. J. Copeland, Deputy Conservator of Forests, reported his return from privilege leave on the afternoon of the 27th August 1891, and received charge of the Pyinmana division from Mr E. A. O'Bryen, Assistant Conservator of Forests, on the morning of the 28th August 1891.

7th September 1891.—*No,* 2.—Consequent on the absorbtion of the Attaran into the East Salween division and to the appointment of Mr. T. A. Hauxwell, Deputy Conservator of Forests, to the charge of the New Salween, Attaran division, Mr. M. H. Ferrars, Deputy Conservator of Forests, made over and Mr. T. A. Hauxwell, Deputy Conservator of Forests, received charge of the Attaran portion of the Attaran and Agency division on the 4th September 1891.

17th September.—No. 203.—Under the provisions of Article 291 of the Civil Service Regulations; privilege leave for 30 days is granted to Mr. T. A. Hauxwell, Deputy Conservator of Forests, with effect from the date on which he may have availed himself of it.

No. 204.—The following temporary promotions are ordered consequent on the promotion of Mr. J. Nisbet to officiate as a Conservator of Forests, 3rd grade, with effect from the 6th August 1891 :—

Mr. C. W. Palmer, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. A. Weston, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. Jackson, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

No. 204.—The following temporary promotion is ordered consequent on the return of Mr. J. Copeland, Deputy Conservator of Forests, from privilege leave, with effect from the 28th August 1891 :—

Mr. H. Jackson, Deputy Conservator of Forests, 4th (officiating 3rd) grade, to revert to his substantive rank.

23rd September 1891.—*No.* 3.—Mr. T. A. Hauxwell, Deputy Conservator of Forests, made over, and Mr. W. T McHarg, Assistant Conservator of Forests, received, charge of the Salween-Attaran division on the afternoon of the 22nd September 1891.

9.—ASSAM GAZETTE.—

2nd September 1891.—*No.* 7485 *G.*—The following is published for information :

The undermentioned officer has been granted by Her Majesty's Secretary of State for India permission to return to duty as advised in list dated the 31st July 1891. Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Assam.

19th September.—*No.* 8085 *G.*—On the Report of the Centra Examination Committee, the following officers have passed Examinations.

Mr. W. F. Lloyd.—Assamese Higher Standard, Forest Law and Land Revenue.

Mr. J. C. Kelly.—Forest Law.

18th September 1891.—*No.* 8081*G.*—Mr. J. T. Jellicoe, Deputy Conservator of Forests, remains in charge, as a temporary measure, of the Working Plans Division from the 1st September 1891, the date on which he was relieved of the charge of the Assam Conservatorship.

18th September 1891.—*No.* 8082 *G.*—Mr. H. G. Young, Assistant Conservator of Forests, on return from privilege leave, received charge of the Cachar Forest Division from Babu Tara Kisor Gupta, Sub-Assistant Conservator of Forests, on the forenoon of the 8th September 1891.

25th September 1891.—*No.* 8243*G.*—Mr. J. T. Jellicoe, Deputy Conservator of Forests in charge of the Working Plans Division, is placed in charge of the Darrang Forest Division.

Mr. W. F. Lloyd, Assistant Conservator of Forests, Darrang Forest Division, on being relieved by Mr. Jellicoe, is placed in charge of the Working Plans Division.

29th September 1891.—*No.* 8277*G.*—With effect from the 1st of September 1891, in consequence of the reversion of Mr. J. T. Jellicoe to Deputy Conservator of Forests, First Grade,—

Mr. C. G. D. Fordyce to officiate as Deputy Conservator, Third Grade.

Mr. D. Copeland to revert to his substantive appointment of Deputy Conservator, Fourth Grade.

Mr. W. F. Lloyd to officiate as Assistant Conservator, First Grade.

10.—MYSORE STATE GAZETTE.—

8th September 1891 —*No.* 240.—The duty on Tangadi bark in the Bangalore, Hassan, Mysore, Shimoga and Kadur Districts is raised as a tentative measure from Rs. 15 to Rs. 20 per cart-load with effect from the date the same has been enforced under the authority of the Inspector General of Forests.

18th September 1891.—V. Narasimha Murti Rao, Clerk, Plantation Office, is appointed as Ranger, 5th Grade, on Rs. 50 per mensem

with effect from the 24th July 1891 and is posted for duty in the Plantation Department.

The following changes in the Forest Rangers are ordered with effect from the 11th instant :—

(1) Acting 6th Grade Ranger Muddaiya is confirmed in the appointment and will be retained in the Plantation Department, *vice* Krishnaswami Iyer.

(2). Krishnaswami Iyer, 6th Grade Ranger, Plantation Department, is transferred to Kadur, *vice* Abdul Rahman, 6th Grade Ranger, degraded to the post of Forester.